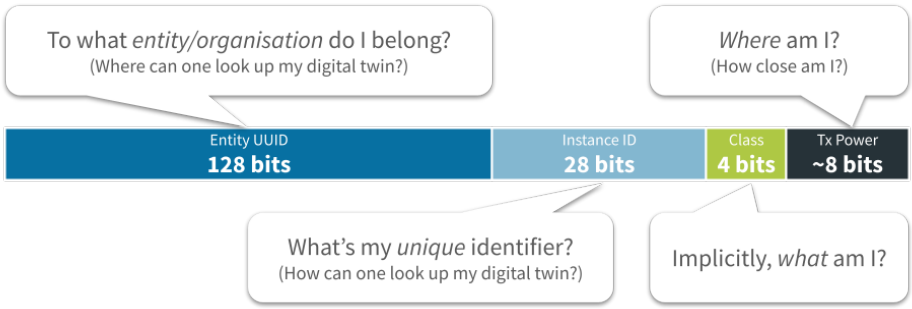
The InteroperaBLE Identifier

An open specification by reelyActive to maximise the interoperability of radio-identifiers across protocols, platforms and operating systems.



The TL;DR (Too Long; Didn't Read)

One identifier ~~to rule~~ compatible with them all.

What's the purpose?	To provide a means of identification that can be interpreted by *all* platforms and readily translated into a URI for potential association with a digital twin.
What's with the BLE?	The open specification was motivated by Bluetooth Low Energy (BLE) interoperability challenges, but is in fact protocol-agnostic.
Can anyone use this?	Yes. It is an open specification and advlib-interoperable is an open source interpreter implementation which is embedded in Pareto Anywhere.

InteroperaBLE Identifier structure **Part 1 of 2**

The identifier consists of four elements which facilitate identification, ranging/location and the lookup of digital twins.

Why digital twins?	A digital twin represents, in a machine-readable-way, the product, person or place with which the identified device is associated.
Why ranging/location?	Knowing *where* the identified device is, and/or *what it is near*, contributes additional machine-readable context.

The four elements

An InteroperaBLE Identifier consists of an Entity UUID, an Instance ID, a transmission power estimation (Tx Power) and an optional Class.

	Entity UUID	128-bits	Identifies the entity or organisation responsible for the device (see Entity UUID subsection below)
	Instance ID	28-bits	Uniquely identifies the individual device (which itself may identify a person, product or place)

	Class	4-bits	*OPTIONAL* Implicitly indicates what is associated with the device, and/or its hierarchy
	Tx Power	—	Facilitates the estimation of proximity, range and/or location

InteroperaBLE Identifier elements

Entity UUID

The Entity UUID is a 128-bit Version 4 (Random) UUID which observes the following form:

XXXXXXXX–XXXX–MXXX–NXXX–XXXXXXXXXXXX

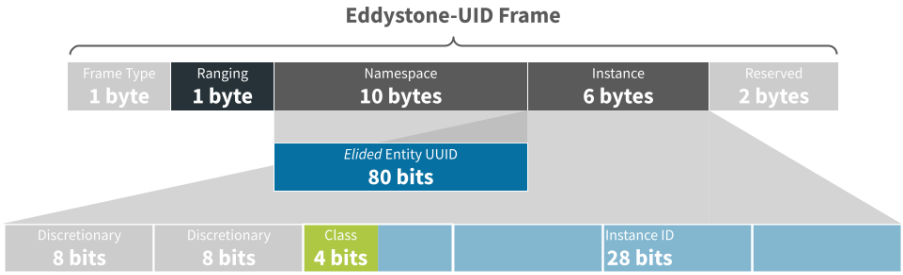
Each character is hexadecimal (0-9, a-f) with the following constraints:

- **X** Any value
  The entire UUID must be unique from that of other entities and organisations
- **M** Must be **4** to represent Version 4
- **N** Upper bits must be 10_b to represent Variant 1
  Valid values for N are therefore **8, 9, a or b**

Implementations

The InteroperaBLE Identifier is implemented as Eddystone-UID or iBeacon as detailed below:

Eddystone-UID iBeacon



Entity UUID	Implement as 80-bit *elided* UUID in the **Namespace**.
Instance ID	Implement in 28 least-significant bits of **Instance**.
Class	Implement in bits 28-31 of **Instance**.
Tx Power	Implement in **Ranging** byte.

The *elided* UUID has the form XXXXXXXX~~-XXXX-MXXX-NXXX-~~XXXXXXXXXXXX where 48-bits are removed from the 128-bit Entity UUID as indicated by the strikeout, as specified in the Eddystone documentation.

InteroperaBLE Identifier interpretation **Part 2 of 2**

How to look up a device's digital twin from the elements of its InteroperaBLE Identifier.

Look up how?	By assembling a URI that points to a digital twin on the Internet or on a local network.
For any device?	No. A URI can only be assembled when the procedure to do so is explicitly known for the given Entity UUID.

Entity UUID interpretation as URI

An InteroperaBLE Identifier may be interpreted as a Uniform Resource Identifier (URI), which may be used to identify anything.

Local .mp3 file 🔗

Interpret as a local .mp3 file of the form **`"file:/xxxxxxx.mp3"`**.

Entity UUID	`496f4944-434f-4445-b73e-2e2f2e6d7033`
***Elided* Entity UUID**	`496f49442e2f2e6d7033`

The Instance ID is interpreted as 7-character-long, leading-zero-padded hexadecimal string (ex: `"0123abc"`). This is prefixed with `"file:/"` and suffixed with `".mp3"` to

complete the URI.

Used by:	/reelyactive/audible-proximity

Entity UUID *alternative* interpretations

An InteroperaBLE Identifier may alternatively be interpreted as something other than a URI. In this case, the 28-bit identifier typically represents an index into a table associated with the Entity UUID.

Unicode Code Point

Interpret the Instance ID as a single Unicode code point (i.e. as UTF-32). The Unicode standard includes over 144,000 characters, including a growing list of emojis, which can be encoded in an InteroperaBLE Identifier, provided they consist of a single code point.

Entity UUID	`496f4944-434f-4445-b73e-5554462d3332`
***Elided* Entity UUID**	`496f49445554462d3332`

For example, Instance ID **`0x001f989`** would be interpreted as  (owl emoji)

DirAct

Interpret as a DirAct proximity beacon.

***Elided* Entity UUID**	`496f4944446972416374`

The Instance ID is the 32-bit DirAct instance.

Used by:	/reelyactive/diract

Button

Interpret as a button press event. Devices such as Minew button wristbands do not transmit button status explicitly in a packet payload, but rather can be configured to transmit a predefined packet (ex: iBeacon or Eddystone) following a button press.

Entity UUID	`496f4944-434f-4445-b73e-427574746f6e`
***Elided* Entity UUID**	`496f4944427574746f6e`

The Instance ID may be ignored. The interpretation is that the device transmitting this Entity UUID is signalling a button press event.

BlueUp "Safety"

Interpret as a BlueUp "Safety" packet. BlueBeacon series devices from BlueUp embed real-time personal safety data, such as button presses, in the minor identifier of an iBeacon packet. By configuring such devices to use the Entity UUID below as the iBeacon UUID, this data can be interpreted from the Instance ID.

Entity UUID	`496f4944-434f-4445-b73e-425553616665`

For example, Instance ID **`0x0008001`** would be interpreted as a short button press and a battery level of 2.99V (consult the BlueUp technical documentation for details).

Where to next?

Continue exploring our open architecture and all its applications.

Best practices for BLE identifiers

Assignment of Bluetooth Low Energy (BLE) identifiers for interoperability and interpretability.

reelyActive Developers

Browse all developer documentation and tutorials.